AD-A140 259 SUMMARIES OF RESEARCH - FISCAL YEAR 1983(U) NAVAL DENTAL RESEARCH INST GREAT LAKES IL FEB 84 NDRI-PR-84-01 1/1

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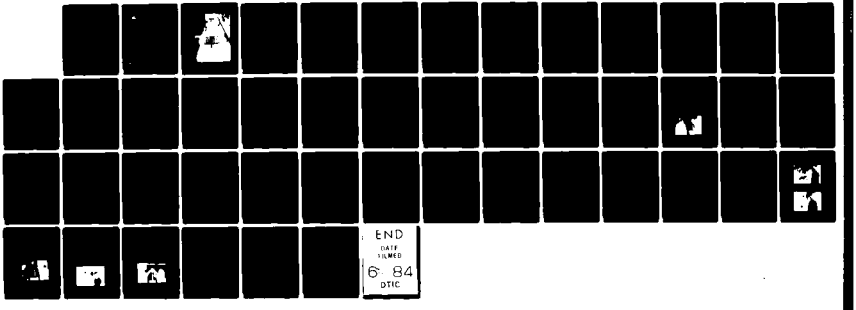

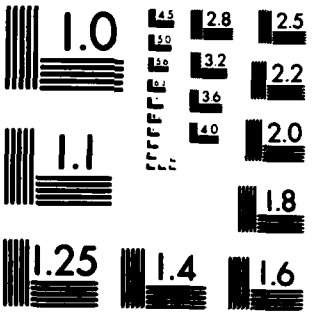

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NDRI-PR 84-01
FEBRUARY 1984

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SUMMARIES OF RESEARCH

FISCAL YEAR 1983

NAVAL
DENTAL RESEARCH
INSTITUTE

Naval Medical Research and Development Command
Bethesda, Maryland

NAVAL DENTAL RESEARCH INSTITUTE
NAVAL BASE, BUILDING 1-H
GREAT LAKES, ILLINOIS 60088

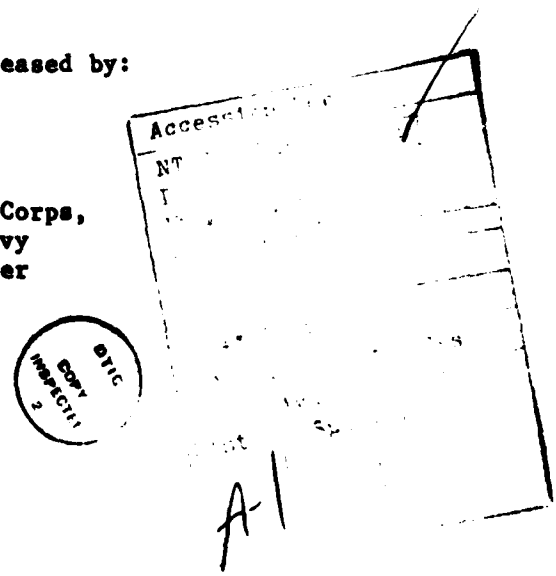
SUMMARIES OF RESEARCH
Fiscal Year 1983

These summaries cover research carried out from 01 October 1982 through 30 September 1983.

This document has been approved for public release; its distribution is unlimited.

Approved and released by:

G. E. CLARK
Captain, Dental Corps,
United States Navy
Commanding Officer



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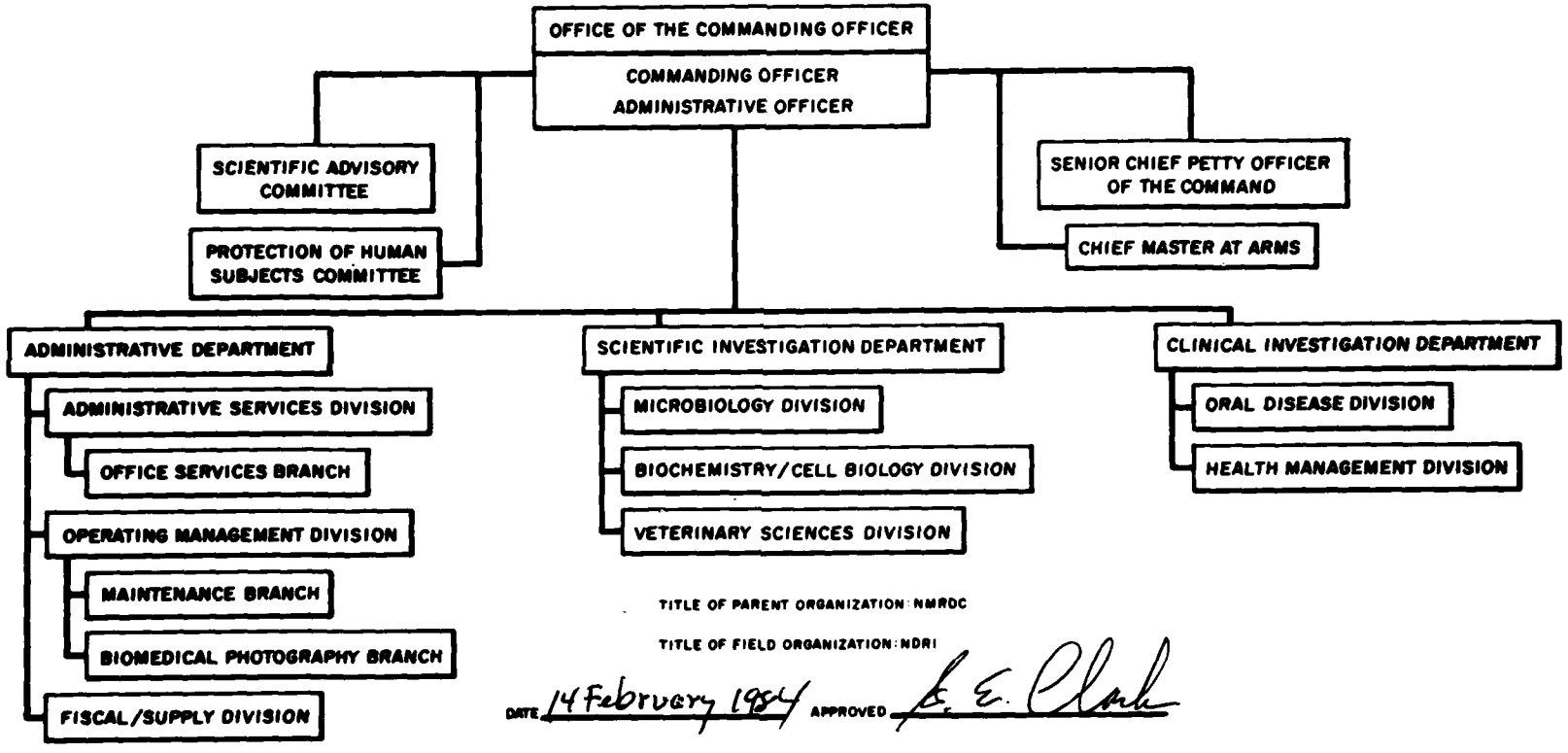
NAVAL DENTAL RESEARCH INSTITUTE



TITLE OF PARENT ORGANIZATION: NMRDC

TITLE OF FIELD ORGANIZATION: NDRI

DATE 14 February 1984 APPROVED E. E. Clark

COMMAND OVERVIEW

COMMAND

The Naval Dental Research Institute was officially established 01 January 1967 with an Officer-in-Charge. The Institute was developed from the Dental Research Facility, which was a Division of the Dental Department of the Naval Administrative Command, Naval Training Center, Great Lakes. The Institute became a fourth echelon command on 27 August 1969. The command is under the direction of the Naval Medical Research and Development Command.

MISSION

The mission of the Institute is to conduct research, development, test and evaluation in dental and allied sciences, with particular emphasis on problems of dental and oral health in Navy and Marine Corps populations and on problems of fleet and field dentistry.

PERSONNEL

As of 30 September 1983, there were on board 10 commissioned officers, 15 civilian employees, and 16 enlisted members, including one U.S. Army Animal Care Technician and one Air Force veterinarian.

ORGANIZATION

The Institute has undergone reorganization since 1967. The current organization of three major Departments is reflected on the preceding page. The Scientific Investigation Department consists of the Microbiology, Biochemistry/Cell Biology, and Veterinary Sciences/Pathology Divisions. Respectively, they carry out required microbiological, serological and bacteriological analysis; biochemical studies of etiological agents and of host factors involved in oral diseases; assistance, advice and preparation of speciemns for histological analysis; and research in the field of laboratory animal medicine and dentistry. The Clinical Investigation Department conducts research related to prevention and treatment of dental and oral diseases with primary emphasis directed toward acute and chronic infections, problems of dento-alveolar trauma and injury, and the delivery of optimal dental care for the naval population. The Administrative Department provides the Institute with supply and fiscal services; library, general clerical services and manuscript preparations; photography and graphics; dental equipment repair; and equipment and facility maintenance, as well as special fabrications and instrumentation support.

FORMAL PRESENTATIONS MADE AT MEETINGS OF SCIENTIFIC SOCIETIES/GROUPS

OCTOBER

BAYCAR, R. S., presented "Portable Dental Equipment" at the Health Services seminar of the annual meeting of the U.S. Naval Reserve Association, Detroit, Michigan.

ESQUIRE, R. G., presented "Perspectives on the Use of Fluorides in Young Adults" at the Chicago Section of the American Association for Dental Research, Chicago, Illinois.

HYMAN, J. J., presented "Dental Epidemiology" at the Preventive Dentistry course for residents at the National Naval Dental Center, Bethesda, Maryland.

KELLY, J. R., presented "Nonprecious Alloys for Fixed Prosthodontics: Constituents, Physical Properties, Biocompatability, Porcelain, Bonding, and Corrosion" to the Veterans Administration Medical Center, North Chicago, Illinois.

JANUARY

BAYCAR, R. S., presented "Fleet Marine Force Dentistry" to the staff of the Naval Dental Clinic, Great Lakes, Illinois.

The Naval Dental Research Institute held a Research Program Planning Conference attended by all NDRI investigators, the Commanding Officer of the Naval Dental Clinic, Great Lakes, Illinois and Captains Nieusema and Shanley of the Naval Hospital, Great Lakes, Illinois.

FEBRUARY

BAYCAR, R. S. and SEROWSKI, A., presented a table clinic entitled "Portable Dental Field Equipment" at the Chicago Dental Society Annual Meeting, Chicago, Illinois.

DIEHL, M. C., presented "Technology Future in Health Care" for the Webster University Program at Hospital Corps School, Great Lakes, Illinois.

KELLY, J. R., presented a table clinic "Autoclaving Dental Anesthetic Carpules - Effects on Carpule Debris, Carpule Survival and Vasoconstrictor Concentration" at the Chicago Dental Society Midwinter meeting, Chicago, Illinois.

McWALTER, G. M., presented "Indirect Pulp Capping" at three seminars - Naval Dental Clinic, Building 1017; Naval Dental Clinic, Building 237; and to the staff of NDRI and guests from the Naval Hospital, Great Lakes, Illinois.

SIMONSON, L. G., presented "Enzymatic Control of Dental Caries" at Abbott Laboratories, North Chicago, Illinois.

FORMAL PRESENTATIONS MADE AT MEETINGS OF SCIENTIFIC SOCIETIES/GROUPS (Continued)

MARCH

The following presentations were given at the Annual Session of the American Association for Dental Research in Cincinnati, Ohio:

CLARK, G. E., "Pain History as a Predictor of Conservative Deep Caries Treatment".

COHEN, M. E., "A Vector Approach to the Angulation of Unerupted Third Molars".

HYMAN, J. J., "Computerized Endodontic Diagnosis".

ESQUIRE, R. G., "Quantitation of Plaque Fluoride Following an Increase in Water Fluoridation".

LAMBERTS, B. L., "Influence of Synthetic Polypeptides on Binding of S. mutans and S. sanguis to Hydroxyapatite".

SHKLAIR, I. L., "The Effect of Anti-Glucosyltransferase Compounds on Caries Activity in Hamsters".

WALTER, R. G., "Prediction of Successful/Unsuccessful Restoration of Deep Carious Lesions Using Radiographs".

PATCH, S. J., presented "Amalgam Crowns and Hybrid Restorations" to the Dental Officers at the Naval Dental Clinic, Great Lakes, Illinois.

APRIL

BAYCAR, R. S., presented "Forensic Dentistry" to the Casualty Care Course conducted by the Naval Dental Clinic, Great Lakes, Illinois.

DIEHL, M. C., presented a lecture on "NBC Defense" to the Casualty Care Course conducted by the Naval Dental Clinic, Great Lakes, Illinois.

McWALTER, G. M., presented "Indirect Pulp Capping - One Appointment vs. Two Appointments" to the Naval Dental Clinic, Great Lakes, Illinois.

MAY

BAYCAR, R. S. and SEROWSKI, A., presented a table clinic "Portable Dental Equipment" at the National Health Service Corps Inservice training Conference, Milwaukee, Wisconsin.

BAYCAR, R. S., presented "Forensic Dentistry" to the Casualty Care Course conducted by the Naval Dental Clinic, Great Lakes, Illinois.

DIEHL, M. C., presented a table clinic "NRDC-NDRI Clinic Computerization" at the Great Lakes Dental Society meeting.

DIEHL, M. C., presented "NBC Defense" to the Casualty Care Course conducted by the Naval Dental Clinic, Great Lakes, Illinois.

FORMAL PRESENTATIONS MADE AT MEETINGS OF SCIENTIFIC SOCIETIES/GROUPS (Continued)

MAY (Continued)

ESQUIRE, R. G., presented "Preventive Dentistry Update from the Naval Dental Research Institute" to the U.S. Navy Officers' Continuing Education Course for Preventive Dentistry and Patient Motivation at the Naval Dental Clinic, San Diego, California.

PATCH, S. J., presented "Clinical Evaluation of Matrix Insets" at the Naval Dental Clinic, Building 1523, Great Lakes, Illinois.

JUNE

BAYCAR, R. S., presented "Portable Dental Equipment" at the Naval Health Service Corps Region V Annual Clinical Conference, Cincinnati, Ohio.

JULY

KELLY, J. R., presented "Nonprecious Alloys for Fixed Prosthodontics" at the Naval Dental Clinic, Building 1017, Great Lakes, Illinois.

AUGUST

LAMBERTS, B. L., presented "Effects of KOH on Specific Optical Rotations of Streptococcal Glucans" at the International Association for Dental Research annual meeting in Sydney, Australia.

PATCH, S. J., presented "Mercury Hygiene" to the professional staff of the Naval Dental Clinic, Great Lakes, Illinois.

SEPTEMBER

DIEHL, M. C., presented "A Computerized Oral Epidemiology Information System in the Naval Dental Clinic" to the Chicago Section of the American Association for Dental Research, Chicago, Illinois.

PRESENTATION MADE BEFORE A COMMUNITY GROUP

FEBRUARY

BAYCAR, R. S., presented "Ocean Currents" to the St. Joseph's Catholic Elementary School, Libertyville, Illinois.

NDRI SEMINAR PRESENTATIONS FOR GREAT LAKES AREA NAVAL DENTAL OFFICERS

OCTOBER

DIEHL, M. C., presented "Composite Resin Bridges and Materials".

NOVEMBER

McWALTER, G. M., presented "Replantation of Avulsed Teeth".

SEROWSKI, A., presented "FDA and Naval Approval Processes for Clinical Investigation of New Drugs and Devices".

SIMONSON, L. G., presented "Enzymatic Control of Dental Caries".

JANUARY

CLARK, G. E., presented "Molecular Components of Cells - Element Composition".

CLARK, G. E., presented "Molecular Components of Cells - Amino Acids".

McWALTER, G. M., presented "Intentional Replantation" and "Transplantation of Teeth - Autogenous".

FEBRUARY

BAYCAR, R. S., presented "Stainless Steel Crowns and Clinical Quality Criteria Evaluation".

KELLY, J. R., presented "Debris from Dental Anesthetic Carpules".

APRIL

HYMAN, J. J., presented "Microcomputer Orientation".

PARTICIPATION IN PROFESSIONAL PROGRAMS AND OTHER MEETINGS

OCTOBER

A meeting of the Chicago Section of the American Association for Dental Research was attended by the following personnel:

CLARK, G. E.	KELLY, J. R.
DIEHL, M. C.	PATCH, S. J.
ESQUIRE, R. G.	WALTER, R. G.

The Great Lakes Dental Society meeting was attended by the following personnel:

CLARK, G. E.
DIEHL, M. C.

A microcomputer and word processing exposition held at the McHenry Community College was attended by:

BAYCAR, R. S.	KELLY, J. R.
DIEHL, M. C.	

BAYCAR, R. S., attended the Annual Meeting of the U.S. Naval Reserve Association in Detroit, Michigan.

CLARK, G. E., attended the Navy League "Welcome Aboard Brunch" in Waukegan, Illinois.

COHEN, M. E., attended a meeting of the Chicago Chapter of the American Statistical Association in Chicago, Illinois.

DIEHL, M. C., attended the Chicago Dental Society meeting on composite resins in Chicago, Illinois.

ESQUIRE, R. G., attended the Alcohol Rehabilitation Service course on diagnosis, care and rehabilitation of patients with alcoholism at the Naval Hospital, Great Lakes, Illinois.

HYMAN, J. J., attended the annual meeting of the Society for Computer Application in Medicine conference in Washington, D. C.

KELLY, J. R., attended the Chicago Dental Society seminar in Chicago, Illinois.

NOVEMBER

The following personnel attended a seminar at the University of Illinois Dental School on "Biological Regulation of Periodontal Reattachments".

CLARK. G. E.	ESQUIRE, R. G.
DIEHL, M. C.	McWALTER, G. M.

PARTICIPATION IN PROFESSIONAL PROGRAMS AND OTHER MEETINGS (Continued)

NOVEMBER (Continued)

CLARK, G. E., attended the Annual Meeting of the American Dental Association in Las Vegas, Nevada.

A meeting of the Chicago Section of the American Association for Dental Research was attended by the following personnel:

ESQUIRE, R. G.
McWALTER, G. M.

The following personnel attended the National Institutes for Health, National Institute for Dental Research, National Caries Program Conference in Louisville, Kentucky:

LAMBERTS, B. L.
SIMONSON, L. G.

SEROWSKI, A., attended the Computer Showcase Exposition at McCormick Place, Chicago, Illinois.

DECEMBER

The Great Lakes Dental Society meeting was attended by the following personnel:

CLARK, G. E.
DIEHL, M. C.
McWALTER, G. M.

CLARK, G. E., attended the Odontographic Society meeting in Chicago, Illinois.

HYMAN, J. J., attended the Chicago Section of the American Association for Dental Research meeting.

WALTER, R. G., attended the Alcohol Rehabilitation Service course on diagnosis, care and rehabilitation of patients with alcoholism at the Naval Hospital, Great Lakes, Illinois.

JANUARY

The Great Lakes Medical Service Corps Luncheon was attended by:

BENNY, J. A.
MERRELL, B. R.

The Chicago Section of the American Association for Dental Research was attended by:

CLARK, G. E.
DIEHL, M. C.
ESQUIRE, R. G.
HYMAN, J. J.
LAMBERTS, B. L.
PATCH, S. J.
SEROWSKI, A.
SIMONSON, L. G.

PARTICIPATION IN PROFESSIONAL PROGRAMS AND OTHER MEETINGS (Continued)

JANUARY (Continued)

CLARK, G. E., attended a meeting of the Chicago Section of the American Association for Dental Research Officers' Program Planning Committee at the University of Loyola Dental School.

McWALTER, G. M., attended the Coolidge Endodontic Study Club meeting in Chicago, Illinois.

McWALTER, G. M., attended the Lake County Navy League Awards presentation at Great Lakes, Illinois.

ROUSE, M. J., attended a meeting of the Lake County Library Consortium at American Critical Care, McGaw Park, Illinois.

FEBRUARY

The Chicago Dental Society Midwinter meeting was attended by the following personnel:

BAYCAR, R. S.	HYMAN, J. J.
BRUTON, W. F.	KELLY, J. R.
CLARK, G. E.	McCORMICK, J. M.
DIEHL, M. C.	McWALTER, G. M.
ESQUIRE, R. G.	TUTEN, E. L.
GOLDING, M. P.	

BENNY, J. A., attended the Great Lakes Medical Service Corps Luncheon.

BENNY, J. A., attended a luncheon of the Great Lakes Women Officers' Network and was elected to the Board of Directors.

A meeting of the Chicago Section of the American Association for Dental Research was attended by the following personnel:

CLARK, G. E.	KELLY, J. R.
DIEHL, M. C.	McWALTER, G. M.
ESQUIRE, R. G.	WALTER, R. G.
HYMAN, J. J.	

The Great Lakes Dental Society meeting was attended by the following personnel:

DIEHL, M. C.	KELLY, J. R.
ESQUIRE, R. G.	McWALTER, G. M.
HYMAN, J. J.	

ESQUIRE, R. G., attended an Oral Pathology Seminar at the Naval Hospital, Great Lakes, Illinois.

PARTICIPATION IN PROFESSIONAL PROGRAMS AND OTHER MEETINGS (Continued)

MARCH

The American Association for Dental Research Annual Session held in Cincinnati, Ohio was attended by:

BAYCAR, R. S.	LAMBERTS, B. L.
CLARK, G. E.	McWALTER, G. M.
COHEN, M. E.	PATCH, S. J.
DIEHL, M. C.	SHKLAIR, I. L.
ESQUIRE, R. G.	SIMONSON, L. G.
HYMAN, J. J.	WALTER, R. G.
KELLY, J. R.	

BENNY, J. A., attended the Women Officers' Network Luncheon.

BENNY, J. A., attended the Congress of the American College of Hospital Administrators in Chicago, Illinois.

APRIL

BENNY, J. A., attended the Board Meeting of the Women Officers' Network.

CLARK, G. E., represented NTC, Great Lakes at the Lake County Heart Marathon Seminar at Baxter Travenol Laboratories, Deerfield, Illinois.

A meeting of the Chicago Section of the American Association for Dental Research was attended by the following personnel:

CLARK, G. E.	SIMONSON, L. G.
LAMBERTS, B. L.	WALTER, R. G.

DIEHL, M. C., attended the Westinghouse Monitor Telecommunications course, Chicago, Illinois.

ESQUIRE, R. G., attended the Exercise Physiology Symposium held by the American Medical Joggers' Association, Boston, Massachusetts.

LAMBERTS, B. L., attended the Lake Forest Chapter of Sigma Xi meeting.

SEROWSKI, A., attended a meeting to discuss portable chair usage in schools at St. Mary's, Evanston, Illinois.

MAY

A meeting of the Chicago Section of the American Association for Dental Research held at Great Lakes, Illinois was attended by the following personnel:

BAYCAR, R. S.	LAMBERTS, B. L.
CLARK, G. E.	SIMONSON, L. G.
DIEHL, M. C.	WALTER, R. G.

PARTICIPATION IN PROFESSIONAL PROGRAMS AND OTHER MEETINGS (Continued)

MAY (Continued)

A meeting of the Great Lakes Dental Society was attended by the following personnel:

BAYCAR, R. S.	DIEHL, M. C.
CLARK, G. E.	ESQUIRE, R. G.

CLARK, G. E., and BENNY, J. A., attended the Great Lakes Women Officers' Network luncheon and meeting.

CLARK, G. E., WALTER, R. G., and BENNY, J. A., attended the Naval Legal Service Office Workshop on Search and Seizure.

CLARK, G. E., attended the Surgeon General's Conference for Commanding Officers in Bethesda, Maryland.

CLARK, G. E., attended the Naval Medical Research and Development Command Commanding Officers' Conference in Bethesda, Maryland.

CLARK, G. E., attended the Armed Forces Day luncheon hosted by the Chicago City Council and Mayor at the Palmer House, Chicago, Illinois.

CLARK, G. E., and ESQUIRE, R. G., attended the Armed Forces Day Ball at the Hyatt Regency Hotel, Chicago, Illinois.

COHEN, M. E., attended the ADP Security Program "Risk Management and Contingency Planning" conducted by the Navy Data Automation Facility, Great Lakes, Illinois.

McWALTER, G. M., attended the Strategic Medical Readiness and Contingency Course in Bethesda, Maryland.

PATCH, S. J., attended Legends of Operative Dentistry sponsored by Northwestern University, Chicago, Illinois.

SIMONSON, L. G., attended the New Separations Seminar sponsored by Bio Rad Laboratories in Oak Brook, Illinois.

SIMONSON, L. G., attended the Illinois Society for Microbiology spring meeting, Chicago, Illinois.

JULY

DIEHL, M. C., attended the Small Computer Systems in Government Seminar in Chicago, Illinois.

ESQUIRE, R. G., attended the Academy of General Dentistry Annual Meeting and Session in Toronto, Canada.

SIMONSON, L. G., attended a meeting for program planning of the Chicago Section of the American Association for Dental Research.

PARTICIPATION IN PROFESSIONAL PROGRAMS AND OTHER MEETINGS (Continued)

AUGUST

BAYCAR, R. S., and SEROWSKI, A., attended a meeting for design review of the face shield project at Scott Aviation in Monrovia, California.

SIMONSON, L. G., attended a meeting of the Great Lakes Dental Society.

SEPTEMBER

A meeting of the Chicago Section of the American Association for Dental Research was attended by the following personnel:

BAYCAR, R. S.	LAMBERTS, B. L.
CLARK, G. E.	McWALTER, G. M.
DIEHL, M. C.	SIMONSON, L. G.
KELLY, J. R.	

CLARK, G. E., attended a meeting of the Odontographic Society at the Chicago Athletic Association, Chicago, Illinois.

COHEN, M. E., attended Computer Software and Multivariate Analysis seminar at Ohio University, Athens, Ohio.

COHEN, M. E., attended a seminar on Sequential Methods in Medical Research at Northwestern University, Evanston, Illinois.

ESQUIRE, R. G., attended the American Dental Association National Video Conference, Chicago, Illinois.

A meeting of the Great Lakes Dental Society was attended by the following personnel:

DIEHL, M. C.	SIMONSON, L. G.
KELLY, J. R.	

SEROWSKI, A., attended the GSA Interagency Training course "Evaluating a Contractor's Performance" in Chicago, Illinois.

The following personnel attended the Laboratory Instrument and Equipment Conference and Exhibition at O'Hare Exposition Center in Rosemont, Illinois:

BRUTON, W. F.	POWELL, E. D.
PEDERSON, E. P.	SIMONSON, L. G.

61153N MR041.20.02-0445 - The Pathogenesis of Oral and Dental Diseases

62758N MF58.524.04B-0004 - Development of Methods for Preventing Oral Diseases and Dental Emergencies

63706N M0095.003-3028 - Development and Evaluation of New Methods and Materials to Arrest Oral Disease and Prevent Dental Emergencies in Naval Personnel

64771N M0933.PN002-0001 - Development of a Marine Corps Expeditionary Dental Shelter (MCEDS)

INDEPENDENT RESEARCH WORK UNITS

61152N MR000.01.01-0038 - Microbial Flora Associated with the Progression of Dental Caries in Established Lesions of Naval Recruits

61152N MR000.01.01-0042 - Evaluation of Dacron Reinforced Silastic as a Replacement for the Temporomandibular Joint Meniscus

61152N MR000.01.01-0043 - Evaluation of Photoelectronic Techniques for the Diagnosis of Irreversible Pulpitis in Naval Personnel

61152N MR000.01.01-0044 - Development of a Field Forensic Dental Kit

61152N MR000.01.01-0045 - Comparison of Fiber-Loaded and Conventional Dental Composite Resins

61152N MR000.01.01-0046 - Pre-Operative State Anxiety and Post-Operative Treatment Demands in Navy Oral Surgery Patients

61152N MR000.01.01-0047 - Mechanism of Localized Bone Loss in Periodontal Disease

61152N MR000.01.01-0048 - Role of Trypsin Activity from Bacteroides gingivalis in Periodontal Disease of Naval Personnel

61152N MR000.01.01-0049 - Prevalence of Dental Treatment Anxiety in Naval Personnel and Effects on Treatment Received

RESEARCH PROGRESS REPORTS - FY 1983

NDRI-PR 82-09	Summaries of Research - Fiscal Year 1982
NDRI-PR 82-10	Number of Independent Variables in the Regression Based Prediction of Oral Health
NDRI-PR 82-11	Method for Automated Entry of a Dental Chart Schematic Using a Computer Card Reader
NDRI-PR 82-12	Streptococcus mutans in Caries-Free and Caries-Active Naval Recruits
NDRI-PR 82-13	Research Abstracts of 1982
NDRI-PR 83-01	Enhancement of Cell Attachment to a Substrate Coated with Oral Bacterial Endotoxin by Plasma Fibronectin
NDRI-PR 83-02	Retention and Extraction of Third Molars in Naval Personnel
NDRI-PR 83-03	Longitudinal Study of Caries Development in Initially Caries-Free Naval Recruits
NDRI-PR 83-04	Adjustable Cardboard Dental Chair and Stool
NDRI-PR 83-05	Automated Dental Epidemiology System: I. Preliminary Investigation and Literature Review
NDRI-PR 83-06	Computer-Assisted Forensic Identification of Military Personnel
NDRI-PR 83-07	Intraclass Correlation and the Application of Analysis of Variance to Dental Data
NDRI-PR 83-08	Prevention of Dental Caries in Hamsters by an Endo-1, 3-α-D-Glucanase
NDRI-PR 83-09	Portable Dental Chair
NDRI-PR 83-10	Nonprecious Alloys for Use in Fixed Prosthodontics: A Literature Review
NDRI-PR 83-11	Applicability of Multiple Covariance Analysis in Caries Studies
NDRI-PR 83-12	Dental Xeroradiography
NDRI-PR 83-13	Automated Dental Epidemiology System: II. Systems Analysis and Functional Design

RESEARCH PROGRESS REPORTS - FY 1983 (Continued)

NDRI-PR 83-14	Dental Caries in the Active Duty Navy Population
NDRI-PR 83-15	Salivary pH-Rise Activities in Caries-Free and Caries-Active Naval Recruits
NDRI-PR 83-16	Microcomputer Employment in the Military Dental Clinic

OTHER PUBLICATIONS

Baycar, R. S., Aker, F. and Serowski, A. Burn Casualties in Combat: A Need for Protective Garments. Military Medicine 148:281, 1983.

Baycar, R. S., Aker, F. and Serowski, A. Portable Dental Chair. Special Care in Dentistry 57-66, 1983.

Cohen, M. E. and Cecil, J. C. Number of Independent Variables in the Regression Based Prediction of Oral Health. Community Dentistry and Oral Epidemiology 10:268-271, 1982.

Cohen, M. E. and Cecil, J. C. Method for Automated Entry of a Dental Chart Schematic Using a Computer Card Reader. Community Dentistry and Oral Epidemiology 10:264-267, 1982.

Cohen, M. E., Schroeder, D. C. and Cecil, J. C. Computer-Assisted Forensic Identification of Military Personnel. Military Medicine 148:153-156, 1983.

Cohen, M. E. and Cecil, J. C. Intraclass Correlation and the Application of Analysis of Variance to Dental Data. Journal of Dental Research 62:322-326, 1983.

Cohen, M. E. and Cecil, J. C. Applicability of Multiple Covariance Analysis in Caries Studies. Community Dentistry and Oral Epidemiology 11:102-104, 1983.

Diehl, M. C. Microcomputer Employment in the Military Dental Clinic. Medical Bulletin of the US Army, Europe 39:14-16, 1982.

Hyman, J. J. Dental Caries in the Active Duty Navy Population. Military Medicine 148:514-517, 1983.

Kelly, J. R. and Rose, T. C. Nonprecious Alloys for Use in Fixed Prosthodontics: A Literature Review. Journal of Prosthetic Dentistry 49:363-370, 1983.

Lamberts, B. L., Pederson, E. D. and Shklair, I. L. Salivary pH-Rise Activities in Caries-Free and Caries-Active Naval Recruits. Archives of Oral Biology 28:605-608, 1983.

Schroeder, D. C., Cecil, J. C. and Cohen, M. E. Retention and Extraction of Third Molars in Naval Personnel. Military Medicine 148:50-53, 1983.

Serowski, A., Aker, F., and Baycar, R. Dental Xeroradiography. Dentistry 83 3:9-12 & 16, 1983.

Simonson, L. G., Lamberts, B. L., Reiher, D. A. and Walter, R. G. Prevention of Dental Caries in Hamsters by an Endo-1, 3-α-D-Glucanase. Journal of Dental Research 62:395-397, 1983.

Simonson, L. G. Prevention of Caries by Insoluble Glucan Component of Plaque. Dental Abstracts 28:373, 1983.

OTHER PUBLICATIONS (Continued)

Simonson, L. G. and Lamberts, B. L. Glucanohydrolases and the Control of Glucans. In: Glucosyltransferases, Glucans, Sucrose and Dental Caries. Sp. Suppl. Chemical Senses, pp. 211-221, 1983.

Walter, R. G. and Shklair, I. L. Streptococcus mutans in Caries-Free and Caries-Active Naval Recruits. Journal of Dental Research 61:1229-1232, 1982.

Walter, R. G. A Longitudinal Study of Caries Development in Initially Caries-Free Naval Recruits. Journal of Dental Research 61:1405-1407, 1982.

DISTINGUISHED VISITORS

OCTOBER

Captain J. McMurrow, Commanding Officer, Naval Regional Finance Center, Great Lakes, Illinois.

NOVEMBER

Captain P. L. Gruendl, Commanding Officer, Naval Administrative Command, Great Lakes, Illinois.

Captain R. L. Spahr, Deputy Commanding Officer, Naval Medical Research and Development Command, Bethesda, Maryland.

Dr. H. W. Lucien, National Research Council, Washington, D. C.

Captain E. H. Plump, DC, USN, Commanding Officer, Naval Dental Clinic, Great Lakes, Illinois.

DECEMBER

The following representatives from the IBM Corporation, Chicago, Illinois visited NDRI:

J. Bakker	T. J. Moran
H. P. Elliott	B. J. Sullivan
D. L. Maxwell	

Captain A. D. Loizeaus, Naval Military Personnel Command, Washington, D. C.

Mr. J. Rippeth, Data Devices, Chicago, Illinois.

CDR Allen, Naval Data Automation Facility, Great Lakes, Illinois.

Mr. A. Ruffold, Naval Data Automation Facility, Great Lakes, Illinois.

Dr. A. Hirata, Diagnostics Division, Abbott Laboratories, North Chicago, Illinois.

Mr. L. Pacina, Data Electronics, Chicago, Illinois.

JANUARY

Mr. F. Wein, Patent Council Office, Office of Naval Research, Chicago, Illinois.

Captain E. B. Hancock, DC, USN, National Naval Dental Center, Bethesda, Maryland.

DISTINGUISHED VISITORS (Continued)

FEBRUARY

Captain D. Nickelson, DC, USNR-R, University of Illinois, Pedodontic Department, Chicago, Illinois.

Mr. P. Kutulas, Advanced Information Systems, American Bell, Oakbrook, Illinois.

MARCH

Dr. Korvin, Korvin Laboratories, Chicago, Illinois.

APRIL

Colonel J. Taylor, Special Assistant for Veterinary Medicine, Naval Medical Research and Development Command, Bethesda, Maryland.

Brigader General F. Q. Ramsey, Chief, Army Veterinary Medical Corps, Washington, D. C.

Captain W. Hall, U.S. Public Health Service, Department of Health and Human Services, Chicago, Illinois.

Dr. M. Schwartz, Boston University, Boston, Massachusetts.

Lieutenant Colonel J. E. King, USA, Health Care Studies and Clinical Investigations, Fort Sam Houston, Texas.

Major J. R. Cooper and Captain G. E. Clark conducting a tour of the Naval Dental Research Institute with Brigader General F. Q. Ramsey.

DISTINGUISHED VISITORS (Continued)

MAY

Mr. P. Kutulas, Advanced Information Systems, American Bell, Oakbrook, Illinois.

JUNE

Dr. P. Robinson, Chairman Periodontics Department, Northwestern University Dental School, Chicago, Illinois.

Captain D. W. Turner, DC, USN (Ret.), Periodontics Department, Northwestern University Dental School, Chicago, Illinois.

Colonel D. V. Osborne, USAF/BSC, Area Coordinator for USAF, Andrews Air Force Base, Washington, D. C.

Captain J. C. Jennett, NC, USN, Commanding Officer, Naval Medical Command Northeast Region, Great Lakes, Illinois.

LCDR J. Huber, NC, USN, Naval Medical Command Northeast Region, Great Lakes, Illinois.

CDR J. M. Engle, NC, USN, ACOS/Logistics, Naval Medical Command Northeast Region, Great Lakes, Illinois.

Captain F. G. Anderson, Jr., MSC, USN, Chief of Staff, Naval Medical Command Northeast Region, Great Lakes, Illinois.

JULY

Dr. J. V. Osterman, Director of Programs and Scientific Advisor, Naval Medical Research and Development Command, Bethesda, Maryland.

Dr. H. A. David, Office of Naval Research Patent Council, Panama City, Florida.

CDR R. A. Rothermel, DC, USN, Naval Dental Clinic, Great Lakes, Illinois.

AUGUST

CDR W. C. Ludwig, MSC, USN, Commanding Officer, Hospital Corps School, Great Lakes, Illinois.

Mr. R. C. Fuller, Naval Manpower and Material Analysis Center Pacific, San Diego, California.

Ms. S. Wilson, Naval Manpower and Material Analysis Center Pacific, San Diego, California.

Mr. W. H. Yoda, System Associates Inc., San Diego, California.

Mr. A. C. Engleberger, Systems Associates Inc., San Diego, California.

DISTINGUISHED VISITORS (Continued)

AUGUST (Continued)

Mr. R. Caudle, Pencept Corp., Chicago, Illinois.

Dr. K. Langeland, Chairman, Endodontics Department, University of Connecticut, School of Dental Medicine, Farmington, Connecticut.

SEPTEMBER

RADM W. V. McDermott, Jr., MC, USN, Commander, Naval Medical Command, Washington, D. C.

Mr. G. Wukitsch, Professional Computers, Chicago, Illinois.

Mr. R. J. McNaughton, RJM Systems, Arlington Heights, Illinois.

CLINICAL INVESTIGATION DEPARTMENT

Availability of the necessary dental equipment and materials, with guidance in diagnostic and treatment procedures, are essential parts of the Independent Duty Hospital Corpsman's aid station armamentarium. Studies were implemented to design and evaluate an upgraded dental emergency treatment kit. The kit is intended to complement a computerized diagnostic procedure, thereby enhancing the capability of independent duty corpsmen to treat dental emergencies.

The dental emergency treatment equipment, ADAL 209, and the dental emergency field kit 6545-00-927-4840 have been procured and evaluated at NDRI. The degree to which the contents of the kits are inadequate for treating a variety of uncommon dental emergencies and their incompatibility with the computerized dental emergency diagnosis and treatment programs in development at NDRI, has been determined. Portable electrically driven handpiece systems have been procured and are being bench tested for potential application. The dental section of NAVEDTRA 10670-B, Hospital Corpsman 1 & C has been reviewed and is under revision at NDRI to meet anticipated needs.

Aeromedical evacuation (MEDEVAC) of personnel stricken by incapacitating dental emergency from shipboard or remote land facilities can add considerable risk and expense to military operations. Comprehensive dental epidemiology information is necessary to intelligently plan, direct and evaluate efforts toward reducing the incidence and detrimental effects of caries and periodontal disease in the military environment.

Preliminary and detailed clinical systems investigations were performed, resulting in the requirements specification for an oral epidemiology information system design. The functional design and a portion of the detailed design work was completed, and initial computer programming undertaken. It was determined that the selected approach to automation would produce a 20% increase in dental screening examination efficiency. A computer printable SF603 dental record format was developed for use with the dental data base and automated dental examination operation.

The most common reason Navy and Marine Corps personnel seek emergency dental treatment is pulpal disease and its sequelae which is mainly caused by deep carious lesions. Diagnostic treatment criteria and the current conservative, restorative treatments for deep carious lesions were assessed for determining the most successful treatment. The objective was to document the most expeditious, conservative treatments of deep carious lesions which promise near 100% success for prevention of dental pulpal emergencies. Analysis of longitudinal data revealed an overall 88% successful, conservative treatment of deep carious lesions in naval recruits for up to four years by Great Lakes, Illinois recruit dental clinic. Overall assessment indicates that the conservative, indirect pulp cap technique has high potential for treating deep carious lesions and preventing dental emergencies.

Arrestment of established carious lesions prior to the onset of debilitating symptoms of pulpal involvement, and of periodontal diseases appears essential to operational sustainability. Studies were initiated to assess the efficacy of routine use of 0.4% stannous fluoride gel in the arrestment of caries and in the

CLINICAL INVESTIGATION DEPARTMENT (Continued)

prevention and treatment of periodontal disease. Since absolute concentrations of periodontal disease-associated organisms in dental plaque have not been reported in the literature, technical parameters were defined for quantifying the organisms selected. Of the three organisms studied (Actinomyces, Fusobacteria and Bacteroides), only Fusobacteria and possibly Bacteroides appeared suitable as indicators for assay in the proposed experiment. A pilot study demonstrated marked trends toward reduction of viable plaque microbial counts of S. mutans, Lactobacilli, Fusobacteria, Bacteroides and total microbes during ten days of daily brushing with a 0.4% stannous fluoride gel. Evidence suggesting the possiblity of subsequent return of these groups to baseline levels indicated the need to include a parallel measure of virulence for defining metabolic compromise of the total microbial aggregate. Assessment of diminished capacity to produce acid in response to use of preventive agents is being explored. Current methods suitable for measuring plaque pH response to sucrose challenge are presently being examined for feasibility.

Half of all Navy and Marine Corps dental emergencies involve inflamed pulp tissue. All traditional pulp testing techniques rely on stimulating pain signals from the tooth's nerve. These techniques do not correlate well with actual pulp disease and are only generally successful as diagnostic aids.

Changes in blood flow through the dental pulp tissue can be related to disease states of the pulp. Blood flow measurements may provide a more sensitive index of the degree of pulp tissue vitality.

Instrumentation was assembled to measure the optical density changes associated with pulpal blood flow. Pulpal blood flow changes were seen but were found to be at the extreme range of present instrument sensitivity. The small electronic signals due to blood flow changes could not be amplified sufficiently to allow reliable measurement. A more sensitive amplifier (microvolt indicating capabilities) was not obatinable at the funding levels budgeted.

During the first six months of enlistment, approximately 50% of the operative dental treatment on the recruit population is completed, with the most severely distressed teeth receiving treatment first. These teeth with extensive caries are often treated with sedative temporary dressings or with pin-retained amalgam restorations. Temporaries may become worn, fractured, or lost in a short period of time. The pin-retained amalgam may take 1.5 hours to complete. An experienced clinician may place a stainless steel crown in 20 to 40 minutes. The stainless steel crown is a more conservative and less invasive restorative method for extensively carious teeth. A study was initiated to compare the feasibility, clinical efficiency and cost effectiveness of this treatment modality with the pin-retained amalgam restoration. After one year, post-operative comparisons in patients treated by both methods show no significant differences in operative time requirements nor restoration longevity.

The enzyme alpha-1, 3-glucanase is a very promising caries preventive agent since it focuses control measures on a most specific pathogenic aspect of dental caries (insoluble glucans). An overwhelming amount of evidence now relates dietary sucrose with the synthesis of water-insoluble alpha-1, 3-glucans by oral bacteria. These glucans have become highly correlated with dental caries and even with

CLINICAL INVESTIGATION DEPARTMENT (Continued)

periodontal disease. This Institute is the only facility in the United States which has the capability of manufacturing an enzyme with the capacity of degrading these insoluble glucans. An alpha-1, 3-glucanase was isolated, purified and characterized. It was shown to prevent dental caries in laboratory hamsters when provided in their drinking fluid. More information regarding glucanases is discussed later on in the section, SCIENTIFIC INVESTIGATION DEPARTMENT.

Available evidence indicates that fear of dental treatment plays a significant role in treatment demand and oral health. Identification of enlistees who may passively resist resolution of dental problems which could affect performance would be useful for targeting interceptive desensitization therapy. An epidemiologic investigation was performed to determine the prevalence of naval recruits who exhibit high levels of treatment anxiety and to ascertain the relative need for treatment and treatment-received by this group.

Diseased, missing and filled surfaces along with scores on the Corah Dental Anxiety Scale were collected from 311 recruits during dental inprocessing. Subjects defined as having low to moderate dental anxiety exhibited a mean of 4.57 diseased surfaces compared to 6.58 surfaces for higher anxiety persons. Thus, oral health was related to dental anxiety in these two distinct groups. Additional data will be collected in order to evaluate treatment need and demand during the one year following recruit training.

A study was conducted to determine if post-extraction demand for treatment could be defined as a function of the degree or preoperative dental anxiety. Dental treatment anxiety of 183 naval recruits scheduled for third molar surgery was measured as well as was post-operative treatment demand. On the basis of anxiety score, these recruits were divided into low (N=155) and high (N=28) anxiety groups. Overall, low anxiety subjects had a mean of 0.271 nonroutine return visits while high anxiety subjects had a mean of 0.571 visits. The percentage of patients who made at least one nonroutine return visit was greater for high anxiety subjects than for low (36 versus 21 percent) but the percentage of these visits that resulted in the prescription of medication was greater for low anxiety patients (83 versus 50 percent). Although these trends were not statistically significant, this was probably the result of low power associated with the small size of the high anxiety group. The available data suggests, therefore, that preoperative dental anxiety may be a potential determinant of certain post-operative demand behaviors. The routine collection, by dental officers or technicians, of information pertaining to a patient's dental anxiety and the initiation of appropriate countermeasures, may reduce the extent of post-operative treatment demand in this setting.

All dental officers are not experienced in forensic identification of human remains. Any Navy dentist, however, may be requested to assist in these evolutions in time of disaster. Timely availability of supportive equipment and guidance is essential to support the Dental Officer in developing knowledgeable awareness of his responsibilities, procedures, and logistic needs. A field dental forensic kit is not listed in the Federal Supply Catalogues. In development of such a kit a thorough literature search was

CLINICAL INVESTIGATION DEPARTMENT (Continued)

completed; guidance from the Navy Decedent Affairs Manual, BUMEDINST 5360.1D, followed; and appropriate armamentarium provided. Included are basic supplies, legal Navy forms, an outline of procedures to be followed, and a list of references available for additional information if required. Refinement of kit contents will continue for compatibility with a computer assisted Navy forensic dentistry identification program being designed at NDRI.

The most commonly used restorative matrix band retainer, the Tofflemier, often fails to adapt to the entire circumference of a badly mutilated molar tooth. This often results in reduced restorative efficiency and increased material wastage. An investigation was conducted to evaluate a standardized band attachment, designed for use with the Tofflemier matrix retainer to form a well adapted, functional matrix which is both time and materials-efficient to use. A clinical trial was performed where clincians evaluated a series of matrix band inset designs for utility. Overall clinician acceptance of this adjunctive restorative device was >85%.

The resin-bonded prostheses provide many advantages to the Navy in terms of economy, dental office and patient time required. They can also dramatically decrease the severity of a dental emergency due to a failed fixed bridge restoration. Current technology requires the use of nickel and beryllium-containing alloys and strong acid solutions to fabricate these prostheses. Approximately 2-10% of military personnel are allergic to nickel alloys. Beryllium dust in the dental laboratory is considered a possible health hazard. Sulfuric and hydrochloric acid solutions must be handled with care to avoid accidents. The etching process evolves hydrogen gas which must be properly evacuated from the laboratory.

An alternative was evaluated to replace this technology for the production of resin-bonded prostheses. A commercially available system for casting a retentive mesh network into the metallic surface of restorations (DuraLingual by Unitek) was compared with an etch-bonded system for microleakage. It was demonstrated that DuraLingual retainers suffer 10x the microleakage at the metal-resin interface than do etched metal retainers. Microleakages at the tooth-resin interface were not different.

Dental laboratories currently have no reliable method to determine whether etched metal surfaces have been properly prepared. Improperly etched metal will not bond strongly to tooth surfaces. Reflection photometry has demonstrated, in this laboratory, the capacity to distinguish between poorly and well-etched metal. A reflection photometer device was developed which is capable of distinguishing between metal etched for 0.25, 0.5, 1, and 3 minutes. Resin-to-metal bond strength data will be correlated with reflection photometric data, and design parameters will be developed for the production of an instrument for dental laboratory use.

Etch-bonded bridges comprised of composite resin only, provide accepted interim dental prostheses. They exhibit, however, a high failure rate at the resin-pontic interface and through the resin itself. A considerable volume of industrial information indicates that linear (vice particulate) fillers enhance resin mechanical properties. A study was performed in which a mathematical model

CLINICAL INVESTIGATION DEPARTMENT (Continued)

was formulated for testing the composite bridge under simulated occlusal stress loadings. Vector analysis and the von Mises Yield Criterion was used to determine the extent and effects of three-dimensional stress distributions within these bridges. Theoretical studies indicate that adding fibers to a conventional (particulate loaded) composite resin will degrade its mechanical properties. Resins loaded with fibers or filaments only, however, should have greater tensile strength and fracture resistance than conventional composite resins. Fiber and filament filler systems and coupling agents, which bond the filler to the resin, were theoretically evaluated. A filler system found to show considerable promise was potassium titanate crystalline filaments with titanate coupling. This filler has a very high tensile strength and the titanate coupling agent appears to have a far greater resistance to hydrolysis than the silane couplers currently used in dental composite resins. Low loading levels of this filler system appear potentially useable in Maryland Bridge cementation, and use of these fillers with a more abrasion resistant resin may produce ideal properties for posterior restorative applications.

NDRI is managing the development and testing of ballistic and fire protective maxillofacial shields which are an integral part of a full body battle dress research and development program directed by Naval Sea Systems Command (NAVSEA). The shields will be compatable with Navy phonetalker and battle helmets being developed under the same project and will be worn on board Navy ships by selective personnel when protection against bullets, fragments and intense heat is necessary.

A contract for design (Phase I) and prototype fabrication (Phase II) was awarded to a civilian manufacturing firm, December 31, 1982. The project is presently in Phase I, during which period new materials, innovative concepts and devices are being researched and tested by the manufacturer. At the first design evaluation, a complex concept was assessed by NAVSEA, NDRI and contractor personnel. NAVSEA decided to make major changes in the contract requirements. At the second evaluation of a simpler design requirement, additional changes in design were suggested. The project is continuing into FY84. Upon approval of the design by NDRI and NAVSEA the contractor will proceed with Phase II.

The Commandant Marine Corps called for the development of field treatment facilities as an integral part of the Marine Corps Environmentally Controlled Medical System (MCEMS) in Work Directive C0083-X, 23 August 1979. The development of a field dental treatment facility was included in this directive. A two operatory facility has been constructed in a rigid shelter at NDRI with modifications of Authorized Dental Allowance List (ADAL) equipment and supplies.

During FY83 refinement and testing continued. The Marine Corps Development and Education Command (MCDEC) contracted with Brunswick Corporation to test the MCEMS and incorporate the Marine Corps Expeditionary Dental Shelter (MCEDS) using the unmodified ADAL. Eight testing and fabrication phases of the complete MCEMS were planned, but only the first phase was completed and futher development discontinued. A report of findings was forwarded to NDRI.

CLINICAL INVESTIGATION DEPARTMENT (Continued)

One portable dental chair system developed in-house for the MCEDS was loaned for six months to the American Dental Association (ADA) for clinical use. It functioned perfectly. In a report received from Commander Robert C. Moe, DC, USN, at the Naval Dental Center, Treasure Island, a similar chair system design was transported to ships in port and dental treatment was provided on board. By eliminating the transportation of patients to and from dental clinics ashore, it was estimated that the loss of 720 fleet-man-hours were prevented each month.

Functional testing is underway in the MCEDS at NDRI. Operative and prosthetic services are being rendered to patients. Working space has not been a problem. Equipment failures have required only minor adjustments. Accidental opening of a circuit breaker during a cold winter period was not noticed for several days and a water valve was destroyed by internal expansion of ice. Water should be drained from the plumbing when the MCEDS is not in use.

Engineering drawings for MCEDS equipment have been completed. Design of packaging for shipment and revision of the operations manual is in progress. All items on the MCEDS inventory list have been procured.

Interest in the shelter has been shown by requests for information from CBLANT and CBPAC. International interest in the collapsable cardboard dental chair and stool continues. Requests for construction plans have been received from CONUS, Europe, South and Central America.

NDRI was advised by NMRDC that the Marine Corps does not currently have a requirement for further development of the MCEDS as constructed at this Institute, and the project was terminated 30 September 1983.

SCIENTIFIC INVESTIGATION DEPARTMENT

One investigation in the Biochemistry Division involved clarifying the nature and significance of the bacterial virulence factors associated with the initial attachment and aggregation of microorganisms, such as S. mutans and S. sanguis, on tooth surfaces, and identifying means to interfere with this process.

Tests were conducted to determine the influence of four synthetic polypeptides -- polylysine (PL), polyarginine (PA), polyglutamic acid (PGA), and polyaspartic acid (PAA) -- on the adherence of ^{3}H-labelled strains of Streptococcus mutans (NCTC 10449 and OMZ 176) and of Streptococcus sanguis (ATCC 10558 and 410) to hydroxyapatite disks. The PL and PA represent basic polymers, which have a net positive electrostatic charge at neutral pH, while the PGA and PAA are acidic polymers with a corresponding net negative charge. All bind strongly to hydroxyapatite under neutral conditions. The PL and PA were found generally to enhance adsorption of the test strains to the hydroxyapatite disks, which had either been exposed only to "buffered KCl", pH 6.8, or had, in addition, been saliva-coated. In most cases the adsorption was increased significantly ($p<0.05$) for both buffer-treated and saliva-coated disks. By contrast, similar tests with the PGA and PAA showed significantly decreased adsorption for all strains, both for buffer-treated and saliva-coated disks ($p<0.05$). In additional tests with PGA and PAA, preincubation of the test strains with 50 mM sucrose did not alter the results appreciably, except for the strongly glucan-producing strain OMZ 176, in which case the electrostatic charge effect was not sufficient to counteract the influence of the glucan. These findings suggest that it would be advantageous, in using agents with a strong affinity for hydroxyapatite for controlling bacterial adherence to teeth, to select those having a net negative charge within the oral pH range. This information should be useful for associated studies at NDRI of enzymes, such as alpha-1, 3 glucanases or dextranases, or of enzyme carriers, that have been under study for the control or reduction of dental caries.

Work within this general context was initiated on the screening of soil, compost, and organic sludge samples for organisms that could produce alpha-1, 3 glucanases which bind strongly to hydroxyapatite under neutral pH conditions. Twenty-five strains were isolated from plates to which samples had been applied from enriched cultures of the crude soil or organic materials. However, the levels of enzyme activities of the strains were found to be very low, particularly after the strains were transferred to and grown in liquid media. We have been investigating culture modifications for these organisms in efforts to stimulate production of the enzymes. Preliminary studies of the alpha-1, 3 glucanases from some of the more active strains have shown marked differences in hydroxyapatite binding by the enzymes. The degree to which these effects may be influenced by pH or buffer concentration, along with studies of other enzymes, are now in progress.

The accumulation of saliva samples from recruits who have no, or very low levels of, S. mutans is in progress. Plaque samples were acquired from recruits who appeared to be caries-free upon their initial examination. The samples were cultured to determine whether or not the subject harbored S. mutans. Samplings

SCIENTIFIC INVESTIGATION DEPARTMENT (Continued)

through April from 96 recruits showed 17 who were considered to be negative for S. mutans from the plaque samples. Saliva samples have been collected about two weeks after the subjects have been identified as S. mutans-negative, at the times they are scheduled for recruit dental day appointments. However, most of the saliva samples from these subjects have shown very low levels of S. mutans ($<10^3$ cfu/ml), rather than being completely free of the organisms. We have decided, for practical reasons, to include the samples in our study for which S. mutans levels do not exceed 10^3 cfu/ml because of the difficulty of acquiring samples completely free of the organisms. Upon collection, all samples are being frozen and will be stored until sufficient samples have accumulated to permit the projected comparative tests of the "low mutans" and control "high mutans" salivas.

Investigations in the Microbiology Division have dealt with determining the relationship of insoluble glucan synthesis and acid formation, and the effects of these factors on caries activity. Other investigations have been concerned with examining the gingival fluids of patients in various states of periodontal health to determine what relationship exists between the presence of immune complexes and destructive periodontal disease.

Studies which involved glucan synthesis and acid formation will be discussed first. Streptococcus mutans is the prime etiologic agent of dental caries. It has been postulated that the cariogenicity of the organism is related to its ability to synthesize lactic acid and water-insoluble glucans. This study is the first to relate both of these virulence factors from the same organism to caries activity in laboratory animals and naval personnel. As of May 1983, 100 dental plaque samples from naval personnel were tested for the presence of S. mutans and the organism's ability to synthesize lactic acid and water-insoluble glucans.

The S. mutans strains were isolated from 53 caries-free naval recruits (CF), 14 caries-active naval personnel (CA) and a random group of 33 naval personnel (RD). The caries-free group had a history of never having had any dental caries, the caries-active group had at least five unrestored carious teeth, and the random group had a history of caries activity, but currently had zero to five unrestored carious lesions.

The S. mutans strains isolated from the above groups were characterized for their ability to synthesize lactic acid and water-insoluble glucan and related to the subjects current clinical condition. The table below refers to results of this effort.

	Caries-Free N=53	Caries-Active N=14	Random Group N=33
Lactic acid micromoles LA/µg DNA	3.9 ± 1.4	4.5 ± 0.4	4.3 ± 0.9
Water-insoluble glucan µg glucan/µg DNA	14.2 ± 12.8	24.2 ± 37.0	15.9 ± 14.8
Water-soluble glucan µg glucan/µg DNA	75.3 ± 43.0	68.5 ± 40.5	61.0 ± 30.2

SCIENTIFIC INVESTIGATION DEPARTMENT (Continued)

The S. mutans isolated from the caries-free group usually synthesized lower levels of lactic acid and water-insoluble glucans when compared to the caries-active group. The S. mutans from the randomly selected group synthesized lactic acid and water-insoluble glucans at levels between the S. mutans from the CF and CA groups. Previous studies have shown that the S. mutans from CA naval personnel produce significantly more insoluble glucans than from caries-free personnel. Lactic acid levels from S. mutans isolated from CF and CA personnel have not been previously reported. These data, although not statistically significant, do show a trend that the S. mutans from caries-active personnel produce more lactic acid than S. mutans from caries-free subjects and are a factor in caries activity.

Eighteen S. mutans strains are to be selected and implanted in germfree rats at Ohio State University Dental School. Two strains each having the characteristics listed below will be tested in the animals:

HG + HA	IG + HA	LG + HA
HG + IA	IG + IG	LG + IA
HG + LA	IG + LA	LG + LA

HG = High water-insoluble glucan synthesizer
IG = Intermediate water-insoluble glucan synthesizer
LG = Low water-insoluble glucan synthesizer
HA = High lactic acid synthesizer
IA = Intermediate lactic acid synthesizer
LA = Low lactic acid synthesizer

So far, eight strains have been selected for testing in the animals this summer. (Due to a delay in obtaining the contract for the germfree animal studies, this phase of the study will begin in June 1983). The eight S. mutans strains have the following characteristics:

Two strains; high water-insoluble glucan + high lactic acid synthesizers
Two strains; high water-insoluble glucan + low lactic acid synthesizers
Two strains; low water-insoluble glucan + high lactic acid synthesizers
Two strains; low water-insoluble glucan + low lactic acid synthesizers

The above strains will be implanted in the germfree rats and the relationship of caries development to the insoluble glucan and acid production will be determined.

To determine what relationship exists between the presence of immune complexes and destructive periodontal disease, gingival fluids of patients in various states of periodontal health were examined. The information regarding the examination of gingival fluids from patients in various states of periodontal health could be used in two ways: (1) modulating the complement system of the host for a potential therapeutic value in the treatment of periodontal disease and (2) measurement of the immune complex (IC) for a potential measure of the severity of periodontal disease as well as a guide to the success of treatment.

STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

SCIENTIFIC INVESTIGATION DEPARTMENT (Continued)

The fibronectin enzyme-linked immunoadsorbent assay (FN-ELISA) previously developed, has been extensively, and now is routinely, used in our laboratory. Previously, problems were encountered utilizing alkaline phosphatase-labeled antibody due to the level of endogenous enzyme in the saliva, which resulted in high background levels. We have replaced the alkaline phosphatase with B-galactosidase (B-gal) labeled antibody with p-nitrophenyl-B-galactopyranoside as a substrate. B-gal is an enzyme found only in E. coli bacteria and not in mammalian cells and is therefore not present in saliva. This enzyme system has greatly improved our ability to detect and quantify FN in the saliva and has eliminated background in the assay. We are currently able to detect as little as 3-5 ng/ml of FN in whole saliva using an indirect type of ELISA. In this assay we use rabbit anti-human FN followed by goat anti-rabbit IgG, IgM labeled with enzyme. In our hands this indirect assay is much more sensitive than the direct-assay in which rabbit anti-human FN labeled with enzyme is used.

Utilizing the FN-ELISA we have determined that the normal level of salivary FN varies between approximately 5-25 ng/ml (plasma level = 300 μg/ml) of whole saliva. A normal individual is defined as an indvidual with no overt oral disease or oral lesions (other than caries) and in good general health. Additionally, the majority of this salivary FN is in the soluble form found in the supernate of clarified saliva and not associated with the cellular debris and particulate matter of the pellet.

The source of this salivary FN has yet to be fully elucidated. Epithelial cells obtained by scraping the mucosal areas of the mouth, buccal, tongue, gingival, etc., are positive for cell surface FN by fluorescent antibody techniques. (In the near future we are planning to begin looking at the saliva from specific salivary glands to determine the FN content.) It would appear at this point, that the majority of the salivary FN is diffusing into the salivary gland from the blood plasma since other plasma proteins are commonly found in saliva also. We are also planning to determine if changes in plasma FN levels due to disease, stress, etc. are mimicked in the salivary FN.

The situation in individuals with acute or chronic oral disease presents a different picture. In these individuals, there are increased salivary FN levels which appear to be related to the severity of the disease. Levels of up to 50-60 μg/ml have been obtained in individuals with severe periodontal disease. We are currently examining this phenomenon more closely by sequential sampling of patients undergoing treatment for periodontal disease. An initial saliva sample is obtained prior to the initiation of treatment and at each subsequent treatment appointment. In this way we hope to determine if salivary FN levels decrease during treatment and the eventual healing process. Preliminary data suggest that this may be the case. While these data represent only a limited number of patients through only a portion of their treatment, our findings suggest that FN may play an important role in oral disease.

The source of this additional FN in these patients appears to be derived directly from the blood plasma. This could be from the exposed capillary beds in the periodontal pockets and other breaks in the mucosal layer of the mouth. (We hope to study this phenomenon in greater detail in the future.)

SCIENTIFIC INVESTIGATION DEPARTMENT (Continued)

Much of this preliminary data suggests that salivary FN plays a significant role in healing and recovery from oral disease. It may be that by augmenting the salivary FN levels we could speed the body's recovery process. Adiitionally, with the FN-ELISA assay we have developed we may have a tool to measure the severity of periodontal disease and treatment success.

We have also made significant progress in the area of the influence of FN on the attachment of oral pathogenic bacteria to epithelial cell surfaces. Several investigations have reported the binding of FN to Gram-positive bacteria and the lack of binding to Gram-negative bacteria. We have extended these findings to include several oral anaerobic bacteria including, Fusobacterium nucleatum and Bacteroides melaninogenicus ss. intermedius. Endotoxins, which are complex lipopolysaccharides (LPS) derived from the outer membrane of these bacteria, appear not to bind to FN. Further, surfaces such as plastic which normally bind to FN, when coated with the LPS no longer bind FN. The LPS also inhibited the attachment of fibroblastic tissue cultures to FN-treated plastic culture disks.

We have also done some preliminary experiments utilizing hydroxyapatite disks, which closely resemble the surface structure of the tooth, to bind FN. This data suggests that FN will bind to this surface and will inhibit the binding of several Gram-negative organisms.

STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

ADMINISTRATIVE DEPARTMENT

Fiscal year 1983 continued to be a period of dynamic review, change, transition, implementation, and challenge in all administrative divisions.

The Fiscal/Supply Division further refined the maintenance of Memoranda and Subsidiary Accounts in order to more accurately reconcile monthly financial statements and to better track the command's state of financial health. DTCS Douglass, the Fiscal/Supply Officer, is to be commended for his tenacious attention to detail and dedication to a tedious process. An internal review of the 6.5 financial transactions revealed only minor discrepancies and action was taken to preserve an even better audit trial.

The Operating Management Division has had a most eventful year. Utilizing a transportation internal review, the Division Officer implemented several procedures which have increased the miles per gallon and improved the utilization efficiency of the command vehicle. A telephone internal review helped demonstrate several ways in which we could reduce costs (reduce the number of incoming lines and number of instruments). Implementation of these cost effective measures are now saving the Institute over $2000 a year. Renovation of office spaces began. This has involved the lowering of high ceilings, modernizing electrical fixtures, paneling of walls, and laying carpeting. While enhancing the aesthetic work environment of a building over 60 years old, the renovations will also cut the costs of plastering and painting while also conserving energy. The decision was made to consolidate the Audiovisual Branch function of the division with that of the Naval Hospital, Great Lakes. While a satellite photographic laboratory and one photographer are to be kept at the Institute, the full impact of this decision cannot be fully assessed at this time. Utility costs continue to be of utmost concern. Meters were installed for steam and water at the mid-fiscal year point, which will enable us to better assess and evaluate actual usage. With a physical plant built about 1920, facility maintenance is always a paramount problem and facility modernization and improved efficiency is a daily challenge.

The Office Services Branch continues to diligently strive toward improved and timely operations. Working spaces are being modernized and administrative procedures have been refined. Correspondence files have been made more efficient and state of the art filing cabinets procured. Dated typing equipment has been replaced and the outdated word processing equipment has been replaced. Personnel training and ensuing professional growth was commendable. Scope of work was redefined and expanded as were personnel individual responsibility and accountability.

Individuals within the department continue to pursue higher education and training by utilizing training locally available while on the job as well as taking college courses during their off-duty time.

Overall, this has been another exciting year filled with noteworthy accomplishments and professional growth at all departmental levels. However, there remains enough challenges to keep each of us fully productively occupied during the following year.

HONORS, AWARDS, POSITIONS HELD, CEREMONIES, STAFF ARRIVALS, DEPARTURES AND REENLISTMENTS

OCTOBER

DT1 W. F. BRUTON reenlisted for two years.

The Commanding Officer presented Letters of Appreciation to:

DT1 S. M. BENSHOOF	DT1 J. M. McCORMICK
DT1 S. R. HOEFS	Mr. J. RINGGOLD
Ms. S. J. KLINE	DT2 P. K. TOMBASCO

DT2 T. P. McCARTHY received a Good Conduct Award.

DT3 E. L. TUTEN received a Good Conduct Award.

TSgt A. J. HORTON was selected NDRI's Sailor of the Quarter.

Dr. M. E. COHEN received a Quality Step Increase.

Mr. E. D. PEDERSON received a Quality Step Increase.

Ms. R. C. QUIRING joined the staff of the Microbiology Division.

NOVEMBER

DT1 G. L. BAILEY received a Letter of Appreciation from the Commanding Officer upon his departure from NDRI for duty on the USS Ranger homeported in San Diego, California.

Mrs. G. BAILEY received a Letter of Appreciation from the Commanding Officer for her service to the Command as the Ombudsman.

Captain G. E. CLARK was inducted as a Fellow, International College of Dentists, Las Vegas, Nevada.

DECEMBER

DT2 S. R. HOEFS was advanced to E-6.

DT2 S. L. TAYLOR was advanced to E-6.

JANUARY

DT1 S. L. TAYLOR received the Lake County Council Navy League Award.

DT1 S. L. TAYLOR was selected as NDRI's Sailor of the Quarter.

Ms. P. E. CLARK resigned from the Office Services Branch, Administrative Department.

Mr. J. A. FARNAN resigned from the Fiscal/Supply Division, Administrative Department.

JANUARY (Continued)

Captain G. E. Clark presenting a certificate and pin for 30 years Federal Service to Dr. B. L. Lamberts.

Captain G. E. Clark congratulating Dr. I. L. Shklair for 30 years Federal Service.

HONORS, AWARDS, POSITIONS HELD, CEREMONIES, STAFF ARRIVALS, DEPARTURES, AND REENLISTMENTS (Continued)

JANUARY (Continued)

HM2 D. A. REIHER received a Letter of Commendation from the Commanding Officer, NDRI upon his release from active duty.

Dr. I. L. SHKLAIR received a certificate and pin for 30 years of Federal Service.

Dr. B. L. LAMBERTS received a certificate and pin for 30 years of Federal Service.

FEBRUARY

LCDR M. PORVAZNIK, MSC, USN received a Letter of Appreciation from the Commanding Officer upon his departure from NDRI for duty at the Naval Hospital, Great Lakes, Illinois.

Captain J. R. COOPER, USAF/BSC was promoted to Major.

Ms. E. C. FAIRBROTHER joined the staff of the Office Services Branch, Administrative Department.

Captain G. E. Clark and Mrs. D. Cooper donning Captain Cooper's Major bars at his promotion ceremony.

HONORS, AWARDS, POSITIONS HELD, CEREMONIES, STAFF ARRIVALS, DEPARTURES, AND REENLISTMENTS (Continued)

MARCH

HM2 R. F. ROUSE reported for duty from the Naval School of Health Sciences, Bethesda, Maryland.

DT3 D. E. THOMAS received a Letter of Commendation from the Commanding Officer upon his departure from NDRI for duty at the School of Dental Assisting and Technology, Basic Prosthetics, San Diego, California.

Dr. I. L. SHKLAIR was re-elected as Program Chairman of the International Association for Dental Research/American Association for Dental Research for the Microbiology/Immunology Section.

Mr. W. O. SCHNURRPUSCH joined the staff of the Fiscal/Supply Division, Administrative Department.

Ms. E. D. POWELL received a certificate and pin for 20 years of Federal Service.

APRIL

DT1 J. M. McCORMICK was selected as NDRI's Sailor of the Quarter.

DT1 J. M. McCORMICK received a Letter of Commendation from the Commanding Officer upon his departure from NDRI for duty at the 3rd FSSG, FMFPAC, Okinawa, Japan.

Captain G. M. McWALTER presenting a certificate and pin for 30 years Federal Service to Ms. E. D. POWELL.

APRIL (Continued)

HM1 E. W. LARSON received a Letter of Appreciation from the Commanding Officer upon his departure from NDRI for duty at the Naval Regional Medical Center, Camp Lejeune, North Carolina.

CDR R. G. WALTER, DC, USN was frocked to Captain, Dental Corps, United States Navy.

Ms. R. C. QUIRING was promoted to Biological Aid (Microbiology) GS-4.

MAY

HM1 B. E. JOHNSON reported for duty from the Naval Regional Medical Center, Camp Lejeune, North Carolina.

DN G. EVANS reported for duty from the School of Dental Assisting and Technology, San Diego, California.

DTCS R. L. DOUGLASS received a Letter of Appreciation from the Commanding Officer, Naval Dental Clinic, Great Lakes, Illinois for his individual effort and assistance in planning for the Naval Dental Technicians 35th Anniversary Ball.

Captain G. E. Clark and Mrs. K. Walter donning CDR Walter's Captain bars at his frocking ceremony.

HONORS, AWARDS, POSITIONS HELD, CEREMONIES, STAFF ARRIVALS, DEPARTURES, AND REENLISTMENTS (Continued)

MAY (Continued)

DN G. W. DALM received a Letter of Appreciation from the Commanding Officer, Naval Dental Clinic, Great Lakes, Illinois for his efforts and assistance in planning the Naval Dental Technicians 35th Anniversary Ball.

CDR R. G. ESQUIRE received a Letter of Appreciation from the Commanding Officer, Naval Regional Dental Center, San Diego, California for outstanding contributions as a lecturer in the continuing education program in Preventive Dentistry and Patient Motivation.

JUNE

DN W. L. STROUD was frocked to E-4.

DT3 M. P. GOLDING received a Letter of Appreciation from the Commanding Officer, NDRI upon his release from active duty.

LT J. J. HYMAN received a Letter of Appreciation from the Commanding Officer upon his departure from NDRI for duty on the USS Dixon homeported in San Diego, California.

DT2 T. P. McCARTHY was released from active duty.

JULY

DT1 W. F. BRUTON was selected as NDRI's Sailor of the Quarter.

CDR R. G. ESQUIRE was an inductee in the Fellowship in the Academy of General Dentistry.

The following personnel completed their Postdoctoral Fellowship training:

LCDR M. C. DIEHL
LT J. R. KELLY
LCDR S. J. PATCH

AUGUST

TSgt A. J. HORTON received a Letter of Commendation from the Commanding Officer upon his departure from NDRI for duty at Grand Forks, North Dakota Air Force Base.

DT1 S. R. HOEFS received a citation from the Commander, Naval Training Center, Great Lakes, Illinois for superior performance while serving as Chairman for NDRI for the Navy Relief campaign.

HONORS, AWARDS, POSITIONS HELD, CEREMONIES, STAFF ARRIVALS, DEPARTURES, AND REENLISTMENTS (Continued)

SEPTEMBER

DT1 S. L. TAYLOR received a Letter of Commendation from the Commanding Officer upon her departure from NDRI for duty at the Naval Air Station, Bermuda.

DT3 W. L. STROUD received a Letter of Appreciation from the Commanding Officer upon his departure from NDRI for duty on the USS Hunley homeported in Holy Loch, Scotland.

HM2 R. F. ROUSE received a Letter of Appreciation from the Commander, Naval Training Center, Great Lakes, Illinois for exceptional performance of duty while serving as NDRI's Keyperson for the 1983 U.S. Savings Bond campaign.

DT2 R. W. GAMBLE reported for duty from the National Naval Dental Center, Bethesda, Maryland.

DT3 M. J. JOHNSON reported for duty from the Academy of Health Sciences, Fort Sam Houston, Texas.

Dr. L. G. SIMONSON received a certificate and pin for 15 years of Federal Service.

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Summaries of Research

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Brief summaries of research done from 01 October 1982 through 30 September 1983, including presentations, publications and distinguished visitors.

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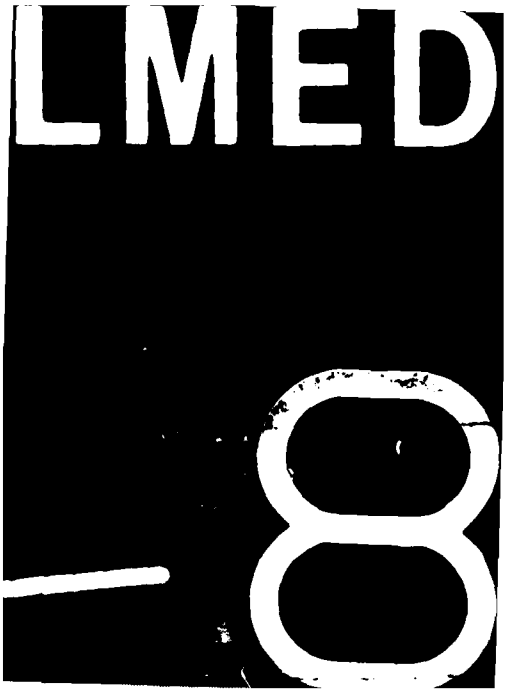
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